SUPPLEMENT
TO APPENDIX B

DOTY & ASSOCIATES
ENVIRONMENTAL, GROUND-WATER AND WASTE MANAGEMENT ENGINEERS

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May 28, 1992
1801-17

Mr. Jim Shaffer
Advanced Sciences, Inc.
405 Urban Street
Suite 401
Lakewood, CO 80228

5-28-92
FILE

Subject: OU8 Information

Dear Mr. Shaffer:

This letter transmits information to you regarding various Operable Unit 8 (OU8) issues. The main issues addressed in this letter are listed below.

- Our comments on figures based on a review of the drawings for OU8 Individual Hazardous Substance Site (IHSS) locations.
- The status of photographs for the various OU8 IHSSs.
- A transmittal of currently available information on footing drains in OU8.

Review of Figures for IHSS Locations

With regard to our review of the OU8 IHSS drawings, we have identified a number of changes that are necessary in order to make the IHSSs locations better agree with currently available data. These changes are identified on the attached figures, and are briefly explained below. These changes, if made, will make the OU8 IHSS locations better agree with those locations presented in the Historical Release Report which has just been completed by my firm. The exception to this rule is your location for IHSS 150.3 which is more accurately presented in your drawings than in the final HRR.

The following comments are based on the colored figures that we obtained from you on May 14, 1992. The IHSSs are discussed in numerical order, references to figures are based on the ASI numbering system presented in the lower left-hand corners of the figures.

IHSS 118.1 Information obtained during HRR activities indicate that the boundaries of this IHSS should be modified to represent a rectangular area just south of the "notch" on the east side of Building 701 to better represent the former location of the tank. These comments are pertinent to Figures IHSS4 and IHSS9.

IHSS 118.2 Appropriate as presented.

IHSS 132 The boundaries for IHSS 132 are not presented on Figures IHSS9 or IHSS4. HRR information indicates that the boundaries for this site should be located east of Building 701 and IHSS 118.1, which is northeast of the IAG location.

IHSS 135 Appropriate as presented.

IHSS 137 Appropriate as presented.

IHSS 138 Information obtained during HRR activities indicate that the boundaries of this IHSS should be located a small distance east of the location presented in Figure IHSS6.

IHSS 139.1 Appropriate as presented.

IHSS 139.2 Appropriate as presented.

IHSS 144 Based on engineering drawings obtained during HRR activities, IHSS 144(N) should be located east of Building 701 and IHSS 132. Since the exact location of the sewer line break between Buildings 777 and 779 is unknown, the boundaries of 144(S) should include more of the alleyway. This comment pertains to Figures IHSS4, IHSS6, and IHSS9.

IHSS 150.1 Appropriate as presented.

IHSS 150.2 Appropriate as presented.

IHSS 150.3 Appropriate as presented.

IHSS 150.4 It was proposed in the HRR that this IHSS be moved to the west side of Building 750, since the IAG location is inaccurate. This comment pertains to Figure IHSS8.

IHSS 150.5 Information obtained during HRR activities indicates that this IHSS is really a duplicate of IHSS 123.2. Therefore, the boundaries have been deleted in the HRR. This comment pertains to Figure IHSS7.

IHSS 150.6 The boundaries of IHSS 150.6 have been modifies to agree with the IAG. However, it is possible that the IAG location is inaccurate. Since we found no hard information in the course of the HRR study contradicting the IAG boundaries, no changes were made to the boundaries of this IHSS. We have indicated to change the boundaries of this IHSS to the south of the boundaries shown on Figure IHSS6, including portions of Buildings 705 and 706. This comment pertains to Figures IHSS6 and IHSS8.

IHSS 150.7 The location of this IHSS is appropriate, however the west end should be modified to a rectangular shape. This comment pertains to Figures IHSS5 and IHSS9.

IHSS 150.8 The boundaries are appropriate as presented.

IHSS 151 The boundaries are appropriate as presented.

IHSS 163.1 Appropriate as presented.

IHSS 163.2 Appropriate as presented.

IHSS 172 Information obtained during HRR activities indicate that the boundaries of this IHSS be extended, since the roadway was contaminated to the west dock of Building 774. This comment pertains to Figure IHSS2.

IHSS 173 It was proposed in the HRR that this IHSS be reduced in size to include only the southwest corner of Building 991. Interviews and documentation indicate that activities which may have affected the site took place only at the south dock of Building 991. This comment pertains to Figure IHSS10.

IHSS 184 The boundaries of IHSS 184 appear to be too far north. The site location was not changed as a result of HRR activities, and should presumably

be the same as that presented in the IAG. This comment pertains to Figure IHSS10.

IHSS 188 Appropriate as presented.

The original colored figures are attached and are marked-up in pencil.

OU8 IHSS Photographs

Photographs were taken of OU8 IHSSs yesterday, May 27, 1992. These photographs were taken by the RFP Photography Department with my help, and will be ready for review approximately June 15, 1992. Two copies of each photograph will be made. A number of IHSS sites will be addressed through the use of low-level aerial photographs from recent years. Low-level aerial photographs at the RFP are done on an annual basis. Should any of the current aerial photographic coverage of OU8 prove inadequate, arrangements can be made for additional low-level aerial photographs to be taken in the month of June. Clearly these low-level aerial photographs will not be ready for a June 22, 1992 deliverable, but they can be ready for the fall deliverable. A number of OU8 IHSSs cannot be adequately covered by aerial photography, and for those we have taken ground-level shots.

Footing Drains

Footing drains in the OU8 area for which relatively complete information exists are located as described below. Also presented with these location descriptions is an evaluation of IHSSs potentially impacted by the footing drains, as well as a description of the locations at which these footing drains could be sampled.

- A footing drain is located along the tunnel that connects Buildings 771 and 776. This footing drain is not identified on any known engineering or utility drawings, but is expected to run along the north-south tunnel the full distance between Buildings 771 and 776. This footing drain is currently inoperative (the water collected by it must be pumped to the ground surface and the pump that does this is currently "locked out"). This footing drain, if operative, has the potential to impact groundwater flow near IHSSs 118.1, 132, 139.1(s), 139.2, 144, and 150.2 in OU8. This footing drain, if operative, would pump collected groundwater to the surface near the northwest corner of Building 701.

- A footing drain is located on the south side (and partially on the west and east sides) of Building 771. This footing drain discharged to South Walnut Creek to the northwest of Building 771 until sometime in the 1970's or 1980's. Drawings and records are available regarding these old discharge points. However, the current discharge from this footing drain is believed to be in the same general location of the Building 774 footing drain discharge to the north of Building 774. I have not yet identified any documentation of this change in discharge point for the Building 771 footing drains, but I have spoken to more than one person who has alluded to this change. The change in discharge point was made during the modification of drainage, roads and parking lots in the general Building 771 and 774 area. These changes have greatly modified this general area. This footing drain has the potential to impact groundwater flow near IHSSs 118.1, 132, 139.1(S), 139.2, 144, and 150.2.

- A footing drain is located on the south side (and partially on the west and east sides) of Building 774. This footing drain daylights on the hillside north of Building 774 near a small pond. This footing drain has the potential to impact groundwater flow near IHSSs 137 and 150.3.

- A footing drain is also located near the southeast corner of Building 559 along a tunnel that connects Building 559 and Building 528. This footing drain daylights a considerable distance northwest from Building 559 (and southwest from Building 771) on the hillside along a drainage that runs to the northeast. This footing drain has the potential to impact groundwater flow near IHSSs 150.5.

As a further step in evaluating the overall impact of these footing drains on the various IHSSs. I suggest that we run a quick paper calculation of the potential "zone of influence" of each of these footing drains. This evaluation will require some of the groundwater parameter information that should currently be available at ASI. The completion of these calculations will help increase the certainty of which IHSSs are potentially impacted by the footing drains, and will help in the identification of missing groundwater parameter information. This type of evaluation is a part of our current scope of work under Initial Evaluation.

I trust that the above is complete enough for your review and evaluation. If you have any questions or need additional clarification on any points, please call.

Sincerely,
DOTY & ASSOCIATES

Frank J. Blaha

Frank J. Blaha

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April 21, 1992

Mr. Frazer Lockhart
U. S. Department of Energy
Rocky Flats Office
P.O. Box 928
Golden, Colorado 80402-0928

RE: Modification to Work in the IAG

Dear Mr. Lockhart,

Pursuant to Part 32, Paragraph 191 (Additional Work or Modification to Work) of the IAG, CDH and EPA hereby notify DOE that certain IHSSs included in several OUs, and the investigatory and remedial work associated with them, are now to be addressed as part of alternate OUs as follows:

IHSS 122:	From OU 13 to OU 9
IHSS 123.2:	From OU 8 to OU 9
IHSS 124:	From OU 10 to OU 9
IHSS 125:	From OU 8 to OU 9
IHSS 126:	From OU 8 to OU 9
IHSS 127:	From OU 8 to OU 9
IHSS 132:	From OU 8 to OU 9
IHSS 146:	From OU 8 to OU 9
IHSS 147.1:	From OU 12 to OU 9
IHSS 149:	From OU 8 to OU 9
IHSS 159:	From OU 8 to OU 9
IHSS 215:	From OU 15 to OU 9

Rationale: The above IHSSs all constitute part of the Original Process Waste Lines (OPWL) and will be investigated and remedied as such. These changes were recommended by DOE in the now-approved OU 9 Phase I RFI/RI Workplan. They need to be finalized as soon as possible so as not to impact the preparation of the RFI/RI Workplans for the OUs from which they are being moved.

3510

MH45
20

IHSS 156.2: From OU 14 to OU 6

Rationale: This change was recommended by DOE in the now-approved OU 6 Phase I RFI/RI Workplan because of the IHSS location along the Walnut Creek Drainage.

EPA and the Division consider these changes to be a modification to work associated with implementation of the IAG and are effective immediately. Although these changes were recommended by DOE, if you do not agree with any of these changes, you may invoke appropriate dispute-resolution procedures within 14 days. However, we would appreciate early notice of your disagreement so that an attempt can be made to resolve differences before dispute-resolution is invoked.

If you have any questions regarding these matters, please call Joe Schieffelin (CDH) at 331-4421.

Sincerely,

Joe Schieffelin for

Gary W. Baughman
Unit Leader, Hazardous Facilities Unit
Hazardous Materials and Waste Management Division

Martin Hestmark

Martin Hestmark
Manager
Rocky Flats Project
Environmental Protection Agency

cc: Daniel S. Miller, AGO
Barbara Barry, RFPU
Paul Bunge, EG&G
Peter Ornstein, EPA

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June 5, 1992
1801-17

Mr. Jim Shaffer
Project Manager
Advanced Sciences, Inc.
405 Urban Street Suite 401
Lakewood, Colorado 80225

Subject: Foundation Drains which may impact OU8 IHSSs

Dear Mr. Shaffer,

Foundation drains (or footing drains) around some buildings in the PA were studied by us to determine potential impacts on OU8 IHSSs. Information was sought mainly to identify the location of current and historical foundation drains which has been doubted and contradicted in the past by various resources at the RFP. An effort was made to determine which drains are still operational. This letter summarizes information identified and sources reviewed for this information. An attempt was made to quantify the impact some of the drains may have on the water table in the vicinity of OU8 IHSSs. Assumptions made for this effort are stated.

The subject of foundation drains will be an evolving one since new sources of information on these drains are likely to be found in the future. Any additional information we obtain will be evaluated and incorporated with the information in this letter. This has not been an exhaustive study and in the interest of providing you this information as timely as possible, the summaries stated are to be considered in draft form, although they are true and complete to the best of our knowledge.

Location

Several sources of information were used to determine the locations of foundation drains. These are stated below. We have prepared a map (attached) showing the approximate locations of the drains relative to the OU8 IHSSs. The following paragraphs describe the sources used.

1. A set of Foundation Drain Plans identify the approximate locations of the foundation drains around many buildings at the RFP. The twelve drawings are dated June 13, 1975 and are more schematic than design-oriented. We have the complete set obtained from

the RFP Engineering Drawing Room. These are numbered 25581-1 through 25581-12. The set includes drawings of foundation drains specific to Buildings 771, 774, and 779 which indicate the location of the pipes and the direction of flow. No other buildings in the OU8 Area are identified in these drawings. Therefore, it is assumed that the other production buildings that would be of concern to OU8 (e.g. 776/777, 707, 559) do not have foundation drains. Most individual drawings do not show termination points but reference the Area Plot Plan (25581-1) for the termination points. The Area Plot Plan is at a small scale and exact locations of termination points cannot be discerned.

2. An Internal Letter written in May 1977 by N.E. Moody of the RFP General Laboratory describes the locations of building sumps and foundation drains. The letter states the identification number and a brief description of its location with a notation indicating whether it would be expected to be wet or dry. In comparing the information in this letter to the 1975 maps, an additional foundation drain location is described. This foundation drain is FD707-1 and is described as being the storm drain outlet east of the Building 750 Parking Lot. The description of this sampling point includes a statement that it "should pick up water from Buildings 559, 750, 776, 777, 778, and 707." This is of significance because it is the only mention found that describe drainage from these buildings. Because the identification number is prefaced with FD, it was believed to be a foundation drain, but the description is of a storm drain and no other documentation was found which describes foundation drains associated with the mentioned buildings.

3. A sampling program was initiated sometime in the mid 1970s (based on the memory of Ralph Hawes, retired RFP Environmental Group employee) to monitor the quality of water discharging from drains. The results of this sampling program were summarized in a December 1981 report written by Nancy Hoffman (now Nancy Kirk with Procurement Control at the RFP). This report, entitled "Water Quality Data for Foundation Drains and Building Sumps from 1977 through 1981 (Draft)," reiterates and supplements N.E. Moody's Internal Letter in the descriptions of the foundation drain and building sump locations. In preparing the report, Ms. Hoffman traced down the sampling locations in the field using the 1975 maps. She went to the locations indicated to be termination points for the foundation drains and if a discharge pipe was found, it was concluded to be the discharge pipe indicated on the map. No additional analysis was performed, such as dye testing, to determine if the pipes found were truly foundation drain outlets.

4. Original construction drawings were found for portions of Buildings 771 and 774 or additions to them. Foundation drains along the north side of Building 771 were verified from a 1962 (RF-V71-10008) drawing and the drain from the northwest corner of Building 771 to the outlet in a manhole were verified from a drawing from 1952 (RF-70-111-C). For these locations, exact (at the time of the drawing) invert elevations were

stated. Other than these, foundation drains were not identified in other construction drawings and were not able to be verified. A 1989 drawing (38544-102) for the replacement of Tanks 66, 67, and 68 at the southeast corner of Building 774 indicates a designed "perimeter foundation drain" which is a gravel pack over geosynthetic fabric directly adjacent to the foundation and is not representative of the type of foundation drain (pipe) that are the focus of this letter. Where not specifically found, foundation drain invert elevations were estimated based on the design elevations of the building foundations taken from construction drawings.

5. Current RFP Utility Drawings were studied for the existence and location of footing drains in the OU8 area. Several were found in the vicinity of Building 774 and a few near Building 771. In the case of Building 771, these were very close to the ones indicated on the 1975 map. The drains near Building 774 varied significantly. Building 774 has been modified many times since its construction in 1952. Small and large additions were built on to it in all directions from its original configuration.

   It is supposed that the original building was constructed with the foundation drains around it and that subsequent construction activities probably left the drains in place but not serving their original intent. The drains may have been blocked off internally by these construction activities. It is believed that these original foundation drains are indicated on the 1975 map, superimposed over the new shape of the building. In comparing the building outline from the 1975 map with the current building outline on the 1990 Utility Drawings, it is clear that all of the drains indicated in the 1975 map are currently beneath some structure or pavement. The foundation drains indicated on the current utility drawings are noted only where they emerge from beneath the building and its path under the building is unknown. It is not believed that any foundation drains were added subsequent to the construction of the building (or additions) and that one or both of the maps are in error or are incomplete. The veracity of the 1975 map is doubted more than the utility drawing because is schematic in nature and the purpose of the 1975 maps is not currently known.

Working Condition

Foundation drains that are currently in existence are the ones of most concern to the OU8 workplan. For estimating the potential impact of the foundation drain on each IHSS in the OU, all of the foundation drains found from the sources above were included. This was considered to be a conservative approach and also as a direction for continuing investigations. There is one exception to this. The 1975 map indicates a foundation drain along the north side of Building 779. The map indicates a termination point between Solar Ponds 207C and 207A. It is believed that the pipeline between the solar ponds is a storm drain (based on the utility map and discussions with RFP employees) and that the foundation

drain portion was only north of the building. No other documentation or verification was found in support of the current existence of this foundation drain. The configuration of the building has changed since its original construction and construction activities occurred in the late 1980s which affected the foundation of Building 779 in retrofitting for seismic stability. The estimated elevation of this foundation drain is higher than the elevation of the closest OU8 IHSS and it was not considered for further analysis at this time.

The foundation drains are a subsurface network of pipes of various materials. There are no sampling ports, lamplights, or other access points other than the outlet. Therefore, the water quality identified from the outlet water samples are a composite of all waters entering the network and there is no direct and non-intrusive manner to isolate the source of potential contamination (assuming the water sample indicates contamination) and attribute it to one particular IHSS or PAC.

Some buildings in the OU8 Area do not have foundation drains. Buildings 771 and 774 are original production buildings at the RFP. Buildings 559, 707, 750, 776/777, 778, and other main buildings in the area were constructed in different phases after the initial construction. These buildings are equipped with interior building sumps. It is speculated that the buildings were designed without foundation drains, which would direct water away from the foundation, with the intent of allowing groundwater to seep into the building. Infiltrated groundwater would be contained within the building as a means of controlled monitoring and discharge of collected water.

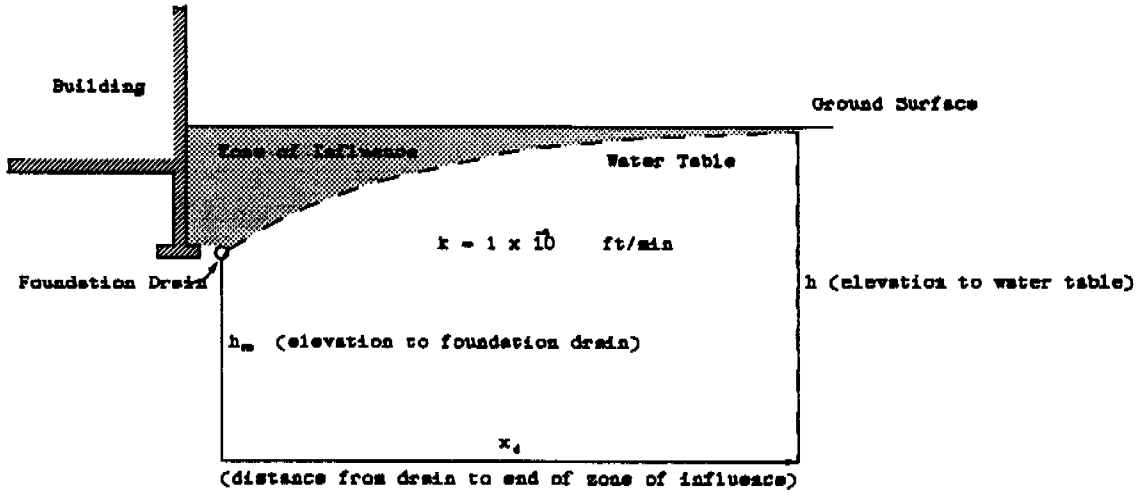
Impact on Groundwater

An evaluation was made in areas where the foundation drains were in close proximity to an OU8 IHSS to estimate if the foundation drain would impact the groundwater beneath the IHSS insofar as drawing down the water table toward the drain and allowing for potential contaminant migration. Many assumptions were made for this evaluation. It was assumed that a foundation drain would collect the same amount of water along its length, that is, flow, Q, is constant and could be measured directly from the termination point of the pipe. All subsurface structures (pipelines, tunnels, tanks) were ignored in respect to effects on groundwater drawdown.

The location of the OU8 IHSSs and the buildings and drains are considered constants. The water table elevation and the flowrate, Q, are variables. A table was prepared which summarized the flowrates and water table elevations necessary to have an impact on the OU8 IHSS. The flowrates can presumably be measured from the termination points and the water table elevations can be estimated from monitoring well control. If these variables are known, then it can be determined if the foundation drains actually impact the groundwater below the OU8 IHSSs. The flowrate is zero if the water table elevation is below the level of the drain.

In this cases, the drains may not have any impact even if the IHSS is directly above the drain. However, there still could potentially be an impact if infiltration of surface water travels through the IHSS toward the drain, even if the water table elevation is below the drain elevation. If the drain loses water through its length, the drain could be impacting the groundwater beneath the IHSS, but this condition cannot be quantified accurately.

To estimate the relationship among flowrate, foundation drain elevation, water table elevation, and location of the IHSSs, an equation was derived to determine the zone of influence from the drain to the point where the water table is no longer impacted by the presence of the drain. This equation was derived from Darcy's Law:



$$Q = kh\frac{dh}{dx}$$

(From Fetter, 1980, p. 133 and McWhorter & Sunada, 1977, p. 97)

Integrating both sides, with flow from right to left gives:

$$Qdx = khdh$$

$$Qx_d = \frac{k}{2}(h^2 - h_{FD}^2)$$

$$x_d = \frac{k(h^2 - h_{FD}^2)}{2Q}$$

or,

This equation is generally used to predict the water table profile. The actual water table is generally greater than the predicted profile because vertical components of flow are neglected (McWhorter & Sunada, 1977, p. 147).

Other basic assumptions for this equation are as follows:

- flow is steady state;
- aquifer is homogeneous and isotropic; and
- the Dupuit-Forcheimer assumptions apply (Freeze and Cherry, 1979, p. 188):
  - flowlines are assumed to be horizontal and equipotential lines are assumed to be vertical;
  - the hydraulic gradient is assumed to be equal to the slope of the free surface and invariant with depth.

Calculations were made, using the elevation of the foundation drain and the elevation of the ground surface of the IHSS, to find flowrates of the drains if the extent of the zone of influence was to the boundary of the IHSS. The attached table summarizes these discharge calculations. The IHSS in question would potentially be affected if the actual discharge from the foundation drain was determined to be less than the flowrate calculated. For a given static water table elevation, a very low flowrate will have a relatively wide zone of influence; conversely, a high flowrate will have a relatively narrow zone of influence.

Flowrates were calculated for fully saturated and half saturated conditions. The fully saturated condition would apply if the water table elevation was just beneath the ground surface (a worst case scenario). The half saturated condition applies if the water table is half way between the ground surface and the foundation drain elevation. Although flowrates were calculated only for fully saturated and half-saturated conditions, it should be noted that the discharges calculated for fully-saturated conditions are twice the discharge rates calculated for half-saturated conditions, indicating a proportional relationship between the flowrate and the amount of saturation when the elevation differences are relatively small.

In cases in which IHSS boundaries and foundation drain boundaries overlap, it is assumed that the IHSS could be affected by the foundation drain regardless of the saturation and flowrate. Also, if the IHSS elevation is less than that of the drain, it is assumed that the foundation drain will not affect groundwater beneath the IHSS.

Conclusion

The information presented in the table should be used as guidance and measured values can be used in the derived equation to determine if there is a potential impact on the IHSS by the foundation drain. ASI has data for these variables that can be used in the equation.

I hope this information and effort are useful for your evaluation. If you need additional information or explanation, do not hesitate to call.

Sincerely,
DOTY & ASSOCIATES

Ann K. Sieben

Attachments: 2

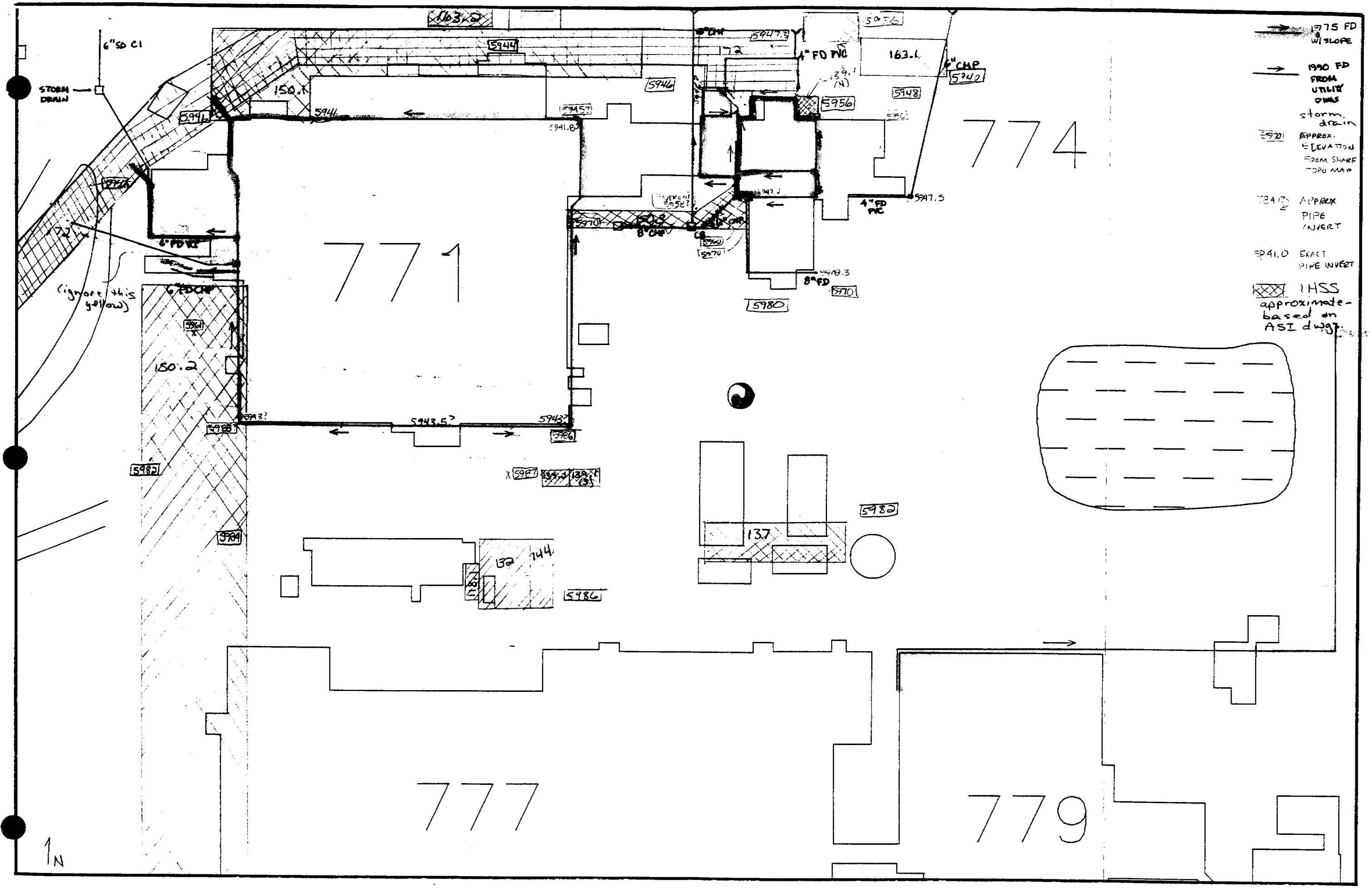
cc: Frank J. Blaha
File 1801-17

ATTACHMENT 2

IHSS #	LOCATION	FOOTING DRAIN ELEVATION (FT.)	GROUND SURFACE ELEVATION (FT.)	FULLY-SATURATED HEAD (FT.)	HALF-SATURATED HEAD (FT.)	FULLY-SATURATED DISCHARGE (GPM)	HALF-SATURATED DISCHARGE (GPM)
Footing drain - south side of Building 771 (runs E-W)							
139.1(S), 139.2	SE corner, Bldg. 771	5943	5987	44	22	4.35	2.17
118.1	E side of Bldg. 701	5943	5986	43	21.5	1.53	0.76
132, 144	E of Bldg. 701	5943	5986	43	21.5	1.91	0.96
137	SE of Bldg. 771	5943	5982	39	19.5	1.29	0.64
150.2	W of Bldgs. 771 & 777	Overlaps footing drain - will be affected regardless of flow and saturation					
Footing Drain - East side of Building 771 (runs N-S)							
150.3	Between Bldgs. 771 & 774	Overlaps footing drain - will be affected regardless of flow and saturation					
137	SE of Bldg. 771	5943	5982	39	19.5	1.29	0.64
Footing Drain - West of Building 771 (runs N-S)							
150.2	W of Bldgs 771 & 777	Overlaps footing drain - will be affected regardless of flow and saturation					
172	NW and N of Bldg. 771	5943	5946	3	1.5	1.33	0.67

IHSS #	LOCATION	FOOTING DRAIN ELEVATION (FT.)	GROUND SURFACE ELEVATION (FT.)	FULLY-SATURATED HEAD (FT.)	HALF-SATURATED HEAD (FT.)	FULLY-SATURATED DISCHARGE (GPM)	HALF-SATURATED DISCHARGE (GPM)
Footing drain - northernmost running E-W out of West side of Building 771							
150.2	W of Bldgs. 771 & 777	5943	5961	18	9	1.33	0.67
172	NW and N of Bldg. 771	Considered unaffected by footing drain due to pavement and opposite slopes					
Footing drain - southernmost running E-W out of West side of Building 771							
150.2	W of Bldgs. 771 & 777	5943	5961	18	9	4.0	2.0
172	NW and N of Bldg. 771	Considered unaffected by footing drain due to pavement and opposite slopes					
Footing Drain - North of Building 771 (runs E-W)							
172	NW and N of Bldg. 771	5941	5944	3	1.5	1.33	0.67
150.1	N of Bldg. 771	Overlaps footing drain (on west end) - will be affected regardless of flow and saturation					
163.2	N of Bldg. 771	5941	5944	3	1.5	0.11	0.05
Footing Drain - South/Central Building 774 (runs E-W and N-S)							
137	S of Bldg. 774	5949	5982	33	16.5	0.47	0.24
150.3	Between Bldgs. 771 & 774	Overlaps footing drain - will be affected regardless of flow and saturation					

IHSS #	LOCATION	FOOTING DRAIN ELEVATION (FT.)	GROUND SURFACE ELEVATION (FT.)	FULLY-SATURATED HEAD (FT.)	HALF-SATURATED HEAD (FT.)	FULLY-SATURATED DISCHARGE (GPM)	HALF-SATURATED DISCHARGE (GPM)
Footing Drain - South/East side of Building 774 (runs E-W)							
137	S of Bldg. 774	5948	5982	34	17	0.37	0.19
Footing Drain - northernmost North of Building 774 (runs E-W)							
150.1	N of Bldg. 771	5946	5944	Footing drain won't affect IHSS - drain elevation greater than IHSS elevation			
northern portion - 139.1(N)	N of Bldg. 774	5946	5936	Footing drain won't affect IHSS - drain elevation greater than IHSS elevation			
163.1	N of Bldg. 774	5946	5940	Footing drain won't affect IHSS - drain elevation greater than IHSS elevation			
172	N of Bldg. 771	Overlaps footing drain - will affect regardless of flow and saturation					
southern portion of 139.1(N)	N of Bldg. 774	5946	5956	10	5	8.9	4.4
Footing Drain - southernmost North of Building 774 (runs E-W)							
southern portion of 139.1(N)	N of Bldg. 774	Overlaps footing drain - will affect regardless of flow and saturation					
172	N of Bldg. 771	5946	5947	1	0.5	0.89	0.44
163.1	N of Bldg. 774	Footing drain won't affect IHSS - drain elevation greater than IHSS elevation					
northern portion of 139.1(N)	N of Bldg. 774	Footing drain won't affect IHSS - drain elevation greater than IHSS elevation					



APPROX SCALE 1" = 300'
1" = 75'

ATTACHMENT 1: FOOTING DRAIN MAP

(Letter; Ann Sieben to Jim Shaffer; 6/4/92)